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Measurement Effectiveness and Efficiency to Improve the IT Services Using ITSM

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***Abstract*—Information Technology Services Management (ITSM) is very important for improving a good service to stakeholders. But to improve, it is very difficult. A company often get a problem to achieve a standardization of Information Technology (IT) services . This paper aims to propose an effectiveness and efficiency design of ITSM through capability maturity model integration (CMMI) in an organization to manage IT division. ITSM is affected by the procedure, performance, and capability of IT division. They determine the success level of the Services Level Agreement (SLA) within the organization. Derived from literature studies and interviews from the organization management [9]ember and the IT user, the paper argue that the practice of information technology infrastructure library (ITIL) done by CMMI is recommended to improve the IT services to support an organization to meet SLA.**

Keywords: ITSM; CMMI; IT Services; SLA

I. Introduction

Measurement of the IT services in an organization is essential. This is to support the company's business performance and used to determine to what extent the ability of IT division in controlling, managing and executing their operational service. Therefore, we need a standardization for improvement and development towards a quality service of IT division [1][2]. A best practice used by the author to conduct research using CMMI strategy to enhance Information Technology Service Management (ITSM) within an organization.

ITSM is a model is to provide [9]T services in a high-level quality [1]. It is then measurement efficiency and effectiveness [9] the IT service within the organization is required. It includes incident management, problem management, release management, configuration management, and change management [2].

Although, there were studies that successfully implemented ITSM within service enterprises such as Hong Kong Science Park, nonetheless, it took a long three years for implementing the ITSM [3]. Additionally, in Nanjing, China, the full function of new Service Desk and how to set up a good Service Desk were established to ensure successful implementation of ITSM [4].

Since, the matter at IT service in a company measuring the degree of ripeness ITSM and limitations in due time. But, there is a little awareness from management team to have standardization for an efficiency and effectiveness in delivering IT services, particularly in education organization [5].

The purpose of this research is to determine the level of IT maturity of ITSM approach to the company and discuss the process of improvement on IT service division towards achievement of SLA.

IT Division at organization in this paper is under operational department which the scope of works includes computer and application systems. The success of the IT division depends to the quality of services. Quality of services fr[9] IT division includes such things as speed, accuracy, efficiency and effectiveness in deliveri[9] IT services to all stakeholders. Therefore, it is necessary to determine the maturity level of the quality services and to improve it.

II. Literature Review

A. [4]IL Frameworks

A methodology used by some companies to manage its information technology is Control Objectives for Information and Related Technology (COBIT) that was developed by Information Systems Audit and Control Association (ISAC).

Another way that GTI, which understood as part of IT macro environment comprise of people, services and IT management, is widely used is the ITIL (Information Technology Infrastructure Library) [6]. It is developed by the British Government and has an efficient structure and it has been adopted by various organizations being recognized worldwide as a standard for service management [6].

Managed IT services includes a set of services necessary for the daily operation of the IT system that includes

- Services help desk
- Software and hardware maintenance services
- Network management and diagnostic services
- Asset management
- Management service changes
- Move, add, activity changes (MAC) [1].

Furthermore, IT service management (ITSM) refers to the implementation and management of quality IT services that meet the needs of the business. ITSM is performed by IT service providers through an appropriate mix of people, process and information technology [4].

The authors proposed for this purpose study the use of ITIL. ITIL defines a framework for ITSM. It is based on industry best practices and it indicates IT organization's roadmap without clarifying the way to do it. With ITIL, it is up to the IT staff to flesh out the details of process flow and to create detailed work instructions [7].

B. ITSM (IT Service Management)

ITIL is considered now as the de facto standard framework for ITSM in organizations which operate their business which is based on IT infrastructure and services [8]. ITSM implementations require a shift in mindset from a technology focused approach, a supporting role, to one that sees the management of the IT role as a function that generates business value and competitive advantage, a service role. ITSM is seen as a framework for change that impacts on people, processes and organization. Here the focus is on customer service and effective governance, on people and structure [9].

C. Maturity Model

Maturity Model shows how good the service or process is done. Typically, the scale level of maturity activity to manage service or process in a basic way, to manage optimally. Maturity models typically have four or five levels of maturity and need to do activities at the lower level and build capacity before reaching a higher maturity level. In general, maturity models are very useful to diagnose and then repair management plan [2].

The Capability Maturity Model Integration (CMMI) is product suite that includes various components and a framework. This is used to generate multiple models and related training and appraisal materials [10]. The components used to generate a specific model are called a constellation. The models are categorized by representations and the types of processes. There are two representations of the model: continuous and staged. The continuous representation enables selections on the order of improvement with respect to an organization's business objectives, and allows comparisons within and between organizations by process areas. The staged representation presents a sequence of improvements, advancing through a predefined and proven path of successive levels, where each level serves as a basis for the next maturity level. It allows comparisons within and between organizations by maturity levels [10]. Fig. 1 illustrate maturity models.

Level	Focus	Process Areas	Quality Productivity
5 Optimizing	Continuous Process Improvement	Organizational Performance Management (OPM) Causal Analysis and Resolution (CAR)	
4 Quantitatively Managed	Quantitative Management	Organizational Process Performance (OPP) Quantitative Project Management (QPM)	
3 Defined	Process Standardization	Requirements Development (RD) Technical Solution (TS) Product Integration (PI) Verification (VER) Validation (VAL) Organizational Process Focus (OPF) Organizational Process Definition (OPD) Organizational Training (OT) Integrated Project Management (IPM) Risk Management (RSKM) Decision Analysis and Resolution (DAR)	
2 Managed	Basic Project Management	Requirements Management (REQM) Project Planning (PP) Project Monitoring and Control (PMC) Supplier Agreement Management (SAM) Measurement and Analysis (MA) Process and Product Quality Assurance (PPQA) Configuration Management (CM)	
1 Initial			Risk Rework

Fig. 1. CMMI-DEV Model

D. Service Level Agreement (SLA).

Service levels are a utility's stated targets to deliver service at a specified level of quality, quantity, and reliability. It relates to equality of treatment, reliability or responsiveness [11]. In addition, they can relate to customer and regulatory requirements, such as response time, complaints, and availability of information. Although a regulator sometimes may mandate service levels, utilities most often select service levels based on customer demands and business drivers and constraints[11].

An SLA sets the expectations between the consumer and provider. It helps define the relationship between the two parties. It is the cornerstone of how the service provider sets and maintains commitments to the service consumer [12].

A good SLA has 5 key aspects, namely;

- Is the service provider is promising
- How will service providers to realize the promise - promise
- Who will measure the service and how.
- What happens if a provider fails to provide the promised service
- How SLA will change from time to time.

III. Research Design

The terms, satisfaction, and quality, are used interchangeably. Service quality is a judgment of stakeholder regarding the overall performance of a service of the organization and its services. Primarily, service quality focuses on how to meet the customers' expectations. Because expectations are dynamic, evaluations may also shift over time, from person to person and from culture to culture [13]. In this research study, the use of research methodology is qualitative in order to identify the problem, take measurements, analyzed the problem and present the results on ITSM exploiting *Goal*

Question Metrics (GQM) analysis [14] and Fishbone model [15] within education organization services.

The first steps of research are identification of existing problems in the organization by knowing the condition of the company by doing observation, documentation and interviews with IT Division and management leader. Next step is measurement of maturity level according to selected ITSM framework that is change management, release management, configuration management, problem management and service desk. Upon measurement, the authors do analysis data to solve the problem using GQM [14]. Next step is the improvement that perform planning and implementation to advance the quality of IT services. The final step is verifying the implementation strategy done by ITSM maturity level. The whole process of research design is captured as below in Fig. 2.

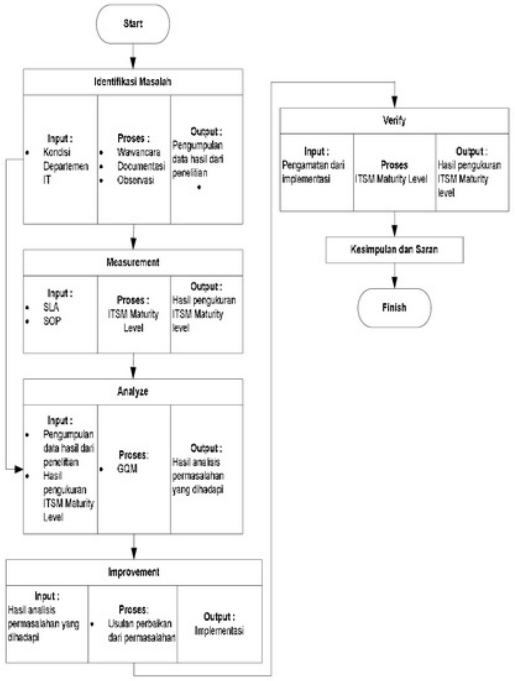

Fig. 2. Research Design

IV. RESULT

A. Problem Identification

IT Division in the organization is a division under of operation department where the scope of the process includes computers and applications used in internal business. The success goal of the IT Division is the quality of service provided. The quality includes several things such as speed, accuracy, efficiency and effectiveness in providing services. It is necessary to measure the quality of maturity level of IT services provided, to improve the quality of service for business.

Through interviews with IT division leaders, operational managers and lecturer there are some things that can be inferred for the IT service in support the business, such as:

1. Does not have standardization of IT services.
2. Problems with data collection of IT assets and Monitoring IT infrastructure and unequal human resource skill.
3. Achieving unfilled SLA and handling any incidents and problems faced in IT services.

And the authors get documentation within

TABLE I. SLA DESCRIPTION

No	Description of SLA	Time
1	The duration of the IT team doing troubleshooting	20 minutes
2	The response to user reports: Phone Email Directly into the IT room	1 minutes 20 minutes 1 x 24 hour
3	Hardware exchange	1 hour
4	Software installation/Services	2 hours
5	Hardware service (in IT Room)	1 x 24 hour
6	Save the log backup data and check the error log	15 minutes
7	Delivery of damaged peripheral to the IT central	1 x 24 hour
8	Follow up to the IT peripherals repair center (when the goods have not been received by the IT Division)	5 x 24 hour
9	The deadline for submission of hardware (calculated from SPHT has been made by the IT Division to receipt of goods into the IT Central Division)	14 x 24 hour
10	Withdrawal requests data from the database	15 minutes
11	A network connection problems	15 minutes
12	There is interference on the system (e.g. virus, Trojans, hackers, system error etc.)	15 minutes
13	Data on the server have been affected (e.g., corrupt, missing, error, hard disk trouble)	20 minutes
14	Request user to use WIFI	10 minutes
15	Return of goods which IT lent to the user	2 x 24 hour

TABLE II. SOP (STANDARD OPERATING PROCEDURE)

No	SOP in Organization
1	Application development request procedure.
2	Data change procedures
3	Data request procedures
4	Procedure handling computer server
5	Server temperature recording procedure
6	IT equipment lending procedures
7	IT equipment return procedures
8	Security procedure - flood attack
9	Security procedures - viruses
10	Procedures for data backup and database

B. Measurement

Measurements were performed using ITSM assessment maturity level application. As result, the criteria of operational conditions in the IT division with reference to the study for each maturity level shown in Table III.

TABLE III. CURRENT RESULT

No	Maturity	Level
1	Configuration Management	2 (Repeatable)

2	Service desk	1 (Initial)
3	Release management	1 (Initial)
4	Problem Management	1 (Initial)
5	Change management	1 (Initial)

From the results obtained above, the authors attempt to provide input to the IT division focused only to improve service desk and problems management performance of service. On the basis of that, the authors seek to improve the balanced of maturity level. The desired target by IT division base on discussion derived from interview data are illustrate in Table IV.

TABLE IV. FINDING RESULT

No	Maturity level	Level	Literature	Target
1	Service desk	1 (initial)	5 (optimized)	3 (managed)
2	Problem management	1 (initial)	5 (optimized)	3 (managed)

C. Process analysis

Based on current condition that has been described above, the authors analyzing the problem through GQM:

Code	Metric Description	Measurable value	Limit Value danger	Status
M1	Percentage of total IT assets without ID with all registered assets	0 %	0	Save
M2	ID of the computer that is duplicated in the inventory application	0 %	0	Save
M3	Percentage of unrecorded computer additions / deductions in inventory applications	7,8 %	0	Danger
M4	Findings of active notebook computer has not been updated	0 %	0	Save
M5	Percentage of incident reports not included in the ticket	Don't have ticketing system	≥ 1.1	Danger
M6	Presentation of incidents handled by the helpdesk does not match the time and priority targets.	not known the exact time	90	Danger
M7	The percentage incidence of incorrect categorization	not known the exact time	60	Danger
M8	The percentage of software that is installed outside the standard software owned Inktomi JWC	3 %	90	Save
M9	The percentage of unused software license	0 %	200	Save
M10	Number of problems that do not match the target time	not known the exact time	90	Danger
M11	Percentage of failure to implement procedures or quality records	0 %	10	Save
M12	Percentage of rejected procedures or quality records	0 %	20	Save
M13	Percentage of procedures or quality records that change	0 %	3	Save

Fig. 3. GQM Metric Current Condition

After doing measurement, several analysis produce difficulty towards service desk and problem management maturity level such as:

1) There is no presence of supporting applications such as service helpdesk application which generate the report, escalation, assignment, and troubleshooting knowledge.
2) There is no balance among personnel / human resources in IT division in terms of IT capabilities.
3) Handling IT services primarily to incidents and problems still need to be improved, because the incident or problem that had been handled very little documentation so that IT staff who have never experienced when handling incidents/problems management will take a long time and sometimes relied on the experience staff.
4) There is no presence of monitoring tools to grab network traffic so if there is a problem on a PC or a network, IT staff has not been able to provide effective and efficient handling.

D. Improvement

After doing the analysis and looking at the existing conditions in the IT division then the authors provide a solution to support the expected results which display in the finding result. Therefore, the authors discuss the improvement of IT services towards SLA that displayed as below.

TABLE V. SOLUTION

No	Problem	Solution
1	There is no service desk application	Create a helpdesk application
2	Need improvement IT person capability	Training for IT staff on capacity building, duties and responsibilities
3	Need improvement to handle incident and problem management	Fixed incident and problem handling procedures by using helpdesk application
4	There is no presence of monitoring tools to grab network traffic	Create application monitoring tools (server, client and network peripheral)

1) Create a Helpdesk application

Creation of Helpdesk application will facilitate IT staff in conducting supervision, escalation, reporting and documentation and knowledge sharing. the application is implemented by having 3 criteria that is:

- Using an open source application called Helpdesk System
- Web-based, the application is accessible to all staff
- Applications can be used in a variety of platforms
- Integrated with email

Here's the look of the Helpdesk application

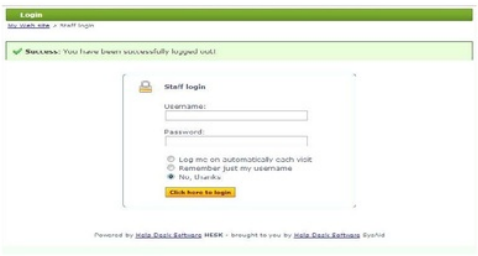

Fig. 4. Example of helpdesk application

2) Training for IT staff on capacity building, duties and responsibilities

Since there unbalance IT personnel / human resources capability in handling a problem for example in the IT division team from 5 members only 1 person who can fix the problem in networking system.

Therefore, the essential training for all IT members on capacity building, duties, responsibilities and knowledge to improve quality of human resource and achieve SLA.

3) Fix incident and problem handling procedures by using Helpdesk application

The author changes the process from the old operational system to the new operational system in which the procedure of incident handling and problems such as the following figure.

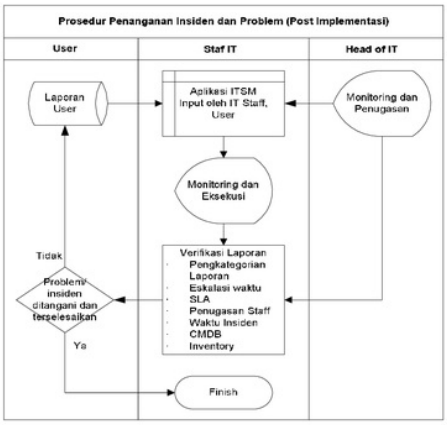

Fig. 5. New Procedure of incident and problem management

4) Create application monitoring tools (Server, Client and Network Peripheral)

The creation of monitoring applications will facilitate IT staff in monitoring the connectivity both in the network or client, by adopting DUDE applications that available in freeware.

Fig. 6. Example of monitoring tools

V. CONCLUSIONS

The use of ITIL framework through ITSM methods in the IT division would help the organization to determine what should be done and to increase the maturity level of incidents and problem management in order to achieve SLA in terms of good quality IT services.

This paper show the best practice ITSM to help to fix existing problems in IT division, particularly in creating helpdesk application and monitoring tools. Additionally, system reporting, monitoring, and tracking can assist the IT Division in handling incidents or problems management. The measureable SLA is achievable. Thus, the readiness of IT staff in handling incidents / problems management is increase.

Although, the paper has contributed for IT division within the organization to improve their performance and fulfill SLA. The limitation of the study can be identified. This is due to time constrain in doing research study. Moreover, from five components service operations that has been identified in this study, the authors only discuss two components and provide the solution. Therefore, in addition to establish Continual Service Improvement within IT division at education service organization the further study need to be done such as completing another three component service operation.

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